



**Department of Energy**  
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MEMORANDUM FOR DISTRIBUTION

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SUBJECT: Lessons Learned from the Test Facility Technical Exchange

The Office of Environmental Management (EM) Office of Waste Processing held a two-day technical exchange at Hanford in early December 2007. The purpose of the technical exchange was to share experiences and lessons learned in the operation of test facilities, so that Department of Energy (DOE) sites could improve the safety, efficiency, and effectiveness of test facility operations. Approximately 60 technical and project management personnel attended the meeting, including representatives from three national laboratories; six contractor firms; DOE-headquarters as well as the Office of River Protection, Hanford, Idaho, and Savannah River sites. I would like to thank all of the participants for sharing their experiences.

During the technical exchange, participants identified detailed lessons learned that they believed deserved attention when planning and further managing pilot plant testing and operations. Subsequent evaluation of the lessons learned presented six broad categories (number of lessons learned noted in parenthesis) as follows: Design (4); Test and Operational Planning (15); Personnel (5); Simulant (1, summary); Equipment (3); and Operations (4). A discussion of the lessons learned, arranged in the above categories and comments pertinent to the Waste Treatment Plant Pretreatment Engineering Platform are included as an attachment to this memorandum. These lessons learned will be of value to those of you using or planning to use test facilities.

Technical exchanges such as this one on test facility design and operations are an integral part of EM's ongoing efforts to share corporate experiences and develop new approaches to significantly reduce technical risks in projects.

I encourage all interested parties to participate in future technical exchanges and workshops to help further ensure EM's success. I also want to acknowledge the efforts of Dr. Walter L. Tamosaitus, of Bechtel National, Inc., for providing the forum for this technical exchange and working with my team to produce the attached summary of the proceedings.

Attachment



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## **SUMMARY OF THE 32 KEY LESSONS LEARNED FROM THE TEST FACILITY TECHNICAL EXCHANGE**

The purpose of the Test Facility Technical Exchange was to share experiences and lessons learned in the operation of test facilities so that Department of Energy (DOE) Sites could benefit and improve the safety, efficiency and effectiveness of test facilities operation. Based on the experiences shared by the presenters, 32 common lessons learned were compiled by WTP personnel and are shown below. These common lessons learned will be directly used in the planning, installation, and startup of the Waste Treatment Plant (WTP) Pretreatment Engineering Platform (PEP). A draft listing of these lessons learned was presented in the last session of the Technical Exchange. The listing below expands the listing shown during the meeting and incorporates notes taken during the meeting and in post meeting discussions. The text following each heading is a synthesis of input developed during the Technical Exchange coupled with results of further post meeting discussions among WTP and Pacific Northwest National Laboratory (PNNL) personnel.

In total, 32 lesson learned were identified for attention and follow up when planning and pursuing pilot plant testing and operations. The 32 lessons learned listing below does not represent priority or order of importance. They have been arranged into six groups only for the purpose of aiding review and use. Overlap exists between groupings and other groupings or subdivisions can be made and may benefit the user. Some comments pertinent to the PEP are included but not intended to provide a complete description. More complete status and basis of the PEP should be obtained from other sources.

### **I. Design**

#### **Document Process Scaling and Assumptions**

**Discussion:** Prototypic scaling of systems designed to undergo testing in a Test Facility should be carefully considered. Establish early in conceptual design a scaling factor, along with the associated technical rationale, that can be applied to the key unit operations and equipment undergoing testing. Thoroughly document the assumptions and basis for the scaling.

**PEP:** In the PEP, a 4.5 scale (linear basis) factor was selected and applied for the prototypic leaching and filtration unit operations. This scale factor was chosen based on having an adequate scale up factor for mixing, using actual filter tube velocities and dimensions, and maintaining key process cycle times. Pipe lengths were not scaled, but flush volumes and hydraulics were designed to be prototypic.

#### **Carefully Select the Site for the Test Facility**

**Discussion:** The site/facility selected for testing should be carefully selected, based on the objectives and programmatic needs associated with the tests. Some private companies provide turnkey testing services including maintenance of environmental permits and may provide lower cost operations. Further, the agility with which private companies can respond to preliminary analyses and revise test instructions or make design changes provides potential benefits. On the other hand, testing within a DOE facility can provide a ready infrastructure for delivering needed services and conduct of

operations. Proximity to the core of engineering and operating personnel provides for added input and sensitivity to the design but may require "tour" coordination. Facility location should also consider the long term use (disposition) of the facility.

**PEP:** The PEP will be located in PNNL's Process Development Laboratory - West (PDL-West) facility. This is a main part of the Hanford campus and in close proximity to engineering/operations personnel as well as project and customer management. It was chosen in part to provide easy visual/technical benefit to those visiting the project as well as project personnel. The facility provides sheltered and separated operations and is in close proximity to laboratories.

### **Logistics and Support Facilities are Important**

**Discussion:** While thought is being put into locating the test equipment, do not overlook the facilities and things needed to support the operation. This includes space to unload supplies, parking, offices, as well as cafeteria and restroom facilities. Ensure that computer support, phones, and other such administrative support can amply be provided. Consider lighting, security, and other environmental type issues.

**PEP:** The PDL-West building was chosen in part for the PEP because it is a stand alone building with ample space around it. It already has office space. Ample lighting will be provided by both building lighting and lighting on the equipment.

### **Evaluate Equipment and Supply Delivery Details**

**Discussion:** Shipping and delivery of equipment can present unusual problems especially if equipment is oversize or very large. Oversize equipment can require special shipping routes and times. Large equipment can require special protection, rigging and handling equipment. The weather can impact both shipping and on-site handling. Ensure equipment pieces are carefully and properly marked before shipment. Maintaining the safety and cleanliness of equipment during shipping can require special measures. The effect of seasonal and environmental variations, especially temperature, on simulants should be considered to ensure precipitation, gelling, etc is addressed. Having to re-clean equipment on-site can require unnecessary efforts as can re-identification of parts.

**PEP:** Special lifting equipment and handling plans were established for the PEP skid sections. Some equipment was rapped in a protection sheeting to keep equipment. Simulant or simulant constituents may be shipped cross country in the fall of 2008 and temperature effects will be addressed.

## **II. Test and Operational Planning**

### **Have a Defined Safety Envelope (lockout tagout program; Hazards Analysis; How you Maintain Testing Within Envelope)**

**Discussion:** Safety of Test Facility operations is paramount to obtaining quality data. A defined safety envelope should be established to ensure personnel safety and equipment protection. The safety

envelope should be established through a multi-discipline hazards analysis and required controls incorporated into the project approach to configuration control.

**PEP:** The PEP design was subjected to a formal Operational Hazards Review (HazOp) process. Controls were incorporated into the design to ensure that testing evolutions could be performed in a safe manner.

### **Pre-plan Waste Management – Waste Disposal Path**

**Discussion:** Materials handling, especially waste management should be planned, not reactive. A boundary should be drawn around the test facility and every input and exit stream identified and dispositioned in the initial planning stages. Waste management planning should address regular Test Facility operations, off-normal conditions, and maintenance and should be developed prior to initiating any test, especially if the simulant being used is designated as Hazardous Waste. In addition, do not overlook vessel heels and residuals in pipelines.

**PEP:** Waste management considerations were incorporated early into the PEP design, including secondary containment and interfaces with the PDL-West liquid effluent collection system. The PEP simulant will require the Hazardous Waste designation. Heel management will be incorporated into the PEP test instructions to ensure prototypic operations.

### **Know Where the “Cliff” is or Carefully Push the Limits**

**Discussion:** When a test facility is operated, the systems interactions can lead to chemistry or control issues not originally envisioned. Conducting parametric testing at smaller scale prior to test platform operation can help define safe and efficient range of operations. Doing this type of testing at lab or bench scale is much lower cost than the larger facility operations. Do prior parametric testing where possible but recognize that some chemical interactions may be hard to duplicate on the bench. Therefore, be very careful of test facility operations as the operating ranges are pushed towards known limits. Potential “cliff” issues should be identified and understood prior to implementation of test plans. Recovery plans should be established incase operational difficulties are encountered. “Cliff” issues can include gelling, precipitation, inadequate mixing, plating out, loss of reaction, etc.

**PEP:** A concurrent External Flowsheet Review Team (EFRT) issue being worked is the process limits (M-6) which will provide input into PEP test planning. Broader process limits testing on the PEP will be incorporated into Phase II, if approved.

### **Consider Data Needs in Planning Testing**

**Discussion:** Existing testing activities can sometimes be leveraged to obtain additional useful information. These additional tests can include data type tests or operational testing. Data needs should be reviewed with all functions prior to writing a test plan. This helps to ensure that synergistic results can be obtained beyond normal process results. For example, corrosion/erosion testing, control scheme testing, or equipment testing may be incorporated.

**PEP:** Items for consideration in the PEP include coupon testing and parametric testing to identify operating limits. Potential expansion of Phase 1 PEP testing scope to resolve issues associated with

process parameters, operating assumptions, erosion/corrosion, or other risk items will be considered. Incorporating the scope from the process operating limits evaluation into the scope of Phase 2 testing will be considered.

### **Consider Duplicate or Triplicate Samples**

**Discussion:** Large numbers of analyses being sent to a single laboratory can cause schedule issues and delay results. Analytical bias may also be present if a single laboratory is used. One mitigation strategy for both concerns is to prequalify and use a number of laboratories for sample analysis. Further, instead of taking single samples, multiple samples should be taken in order to minimize complete loss of the data due to analytical error. Triplicate samples should be taken if the analytical method is new or difficult; duplicate samples should be taken at a minimum. Blind (calibration) samples should be sent to laboratories periodically to monitor performance. Analysis priority should be established prior to testing.

**PEP:** Planning is underway to engage a number of laboratories to provide PEP sample analysis services. The number of samples to be taken during PEP testing evolutions is being re-evaluated.

### **Carefully Pre-Plan Testing and Operating Activities**

**Discussion:** Sufficient time should be scheduled for planning and performance of equipment acceptance testing, testing the C&I systems, classroom and on-the-job training, equipment shakedown, actual testing, and sample and data analysis. Time to issue final reports should be included in planning. The transition from construction to shakedown and operations should also be carefully planned. A turnover process should be established, and the activities scheduled. Further, a transition issue identification and resolution process should be established and used to manage the resolution of issues identified during transition.

**PEP:** Due to the large number of samples to be taken during PEP testing, strategies for sample collection and management of samples and data should be developed and implemented. A strategy will be developed defining how the data obtained from the PEP will be used. Preliminary data products will also be identified. Interfaces between equipment delivery, acceptance testing, shakedown, and Phase 1 testing are being identified, placed on an integrated program schedule, and managed. Detailed test planning is based on a Test Specification and Test Plan that is being reviewed by the Hanford Waste Treatment Plant (WTP), U.S. Department of Energy Office of River Protection (ORP), the External Flowsheet Review Team (EFRT), and other groups such as the Consortium for Risk Evaluation with Stakeholder Participation (CRESP).

### **Have and Maintain Configuration Control**

**Discussion:** Establishing and maintaining configuration control of Test Facility equipment design and testing documents (test specification, test plan, and associated procedures and instructions) is an essential component of the graded approach to conduct of operations. A hierarchy of design and testing documents is needed to ensure configuration control is maintained. Access to the design basis is important when purchasing equipment spares and replacements. A staffed document control station should be provided to enable convenient access to design documents (drawings, specifications, data sheets). The baseline configuration should be established and documented prior to commencing testing.

**PEP:** A documented approach to configuration control for the PEP is being developed and implemented. For the PEP, a list of essential design documents is being prepared that will form the basis for configuration management and an on-site document control area).

### **Implement a JTG with Defined Roles and Responsibilities**

**Discussion:** A Joint Test Group (JTG) should be implemented that has the authority to make changes to the test program within the bounds of the facility's safety envelope. The JTG would review preliminary results of testing, ensure the integrity of the testing activities, and provide documented direction to the shift manager for the day's testing evolutions. The JTG should include representatives from all appropriate parties but yet be a manageable size so that decisions can be readily made. The JTG membership should designate voting and non-voting members.

**PEP:** Proposed members of the PEP JTG would include appropriate personnel from the WTP, PNNL, and DOE representing all critical functions including Engineering, Technical Support, Installations, Testing, and Operations. Changes to test instructions and procedures would be made by the JTG within the boundary of the PDL-W facility safety envelope and PEP hazard analysis.

Current planning calls for two JTGs to be established for the PEP:

- A JTG to oversee water and simulant shakedown activities
- Another JTG to oversee PEP testing.

### **Have a Disciplined Process to Allow Timely Change of Test Procedures and Configuration**

**Discussion:** This lessons learned could be viewed as a subpart of the JTG responsibilities but is separately listed to highlight the need for quick response abilities. A documented approach to allow timely changes of test implementation documents and equipment configuration is needed to facilitate prompt response to preliminary test results. The goal is to enable the documented review and disposition of proposed changes to equipment configuration and test sequencing that arise real time. The following should be performed in order to implement this approach:

- First, a safe operating envelope would need to be established within which operating and testing conditions can be rapidly and safely changed.
- Then, a documented approach would need to be developed providing for the review and disposition of proposed exceedances from the normal operating envelope.

The means to provide rapid operating and testing conditions as well as the approach to review and disposition proposed changes may be documented either in the JTG charter or another test specific document.

**PEP:** Roles, responsibilities, and accountabilities, and authorities will be defined for the two JTGs using input from the Technical Exchange and lessons learned from other successful WTP test programs. A HazOp is being performed that will help determine the safe operating envelope for the PEP.

### **Perform Management Assessment(s) Prior to Testing**

**Discussion:** A management assessment addressing the readiness of the PEP to safely begin testing should be scheduled and performed. Elements of the assessment should include equipment readiness, staffing, training, and maturity of procedures and instructions. The assessment could be graded and staged to address specific activities, such as: acceptance testing, shakedown, and testing. The assessment team should include independent participants such as those involved in test facility operation from other sites and companies. Further, follow up periodic independent assessments should be considered to determine the maturity of testing and operating documents, procedures, etc.

**PEP:** PEP planning includes a management assessment to be conducted prior to initiating simulant shakedown. Based on input from the Technical Exchange, the scope of the PEP management assessment is being re-assessed.

### **Have a Detailed Test Plan**

**Discussion:** A clear, detailed test plan is essential to any successful testing campaign. Further, a method to change the test plan is essential as the learning process evolves. It is suggested that to ensure adequate understanding of the test plan that it be presented and reviewed by appropriate personnel in meeting rather than just by "read and sign".

**PEP:** For the PEP, a Test Specification and Test Plan have been prepared and were reviewed by ORP and WTP staff and members of the EFRT and CRESP. Primary and enabling objectives are included in these test planning documents.

### **Data – Know What You Need, How You are Going to Use it, and the Pedigree Needed**

**Discussion:** As part of the test planning, the testing organization must understand what data are needed from the testing evolutions, how the data will be used, which organizations will use the data, and the type of quality attributes the data must exhibit. The standard(s) to be used to assure satisfactory quality should also be identified. This ensures that the right samples are taken, backup samples are taken (as required), the right analyses are performed, the right quality standards are established, and the right information is developed from the data. Success criteria for testing should be established, understood, and agreed to before testing commences.

**PEP:** For the PEP, these considerations require use of an NQA-1 data acquisition system separate from the PEP's process control system. Plans are being developed to identify how PEP data will be used. The sampling plan is undergoing extensive review to ensure the appropriate samples are being taken when needed. As a result of the Technical Exchange, plans are being developed to staff a dedicated data assessment team during PEP testing evolutions.

### **Communication with Stakeholders**

**Discussion:** A Test Facility communications plan should be developed and communicated that addresses management reporting and interaction with stakeholders. A planned periodic (daily, weekly,

etc) communication package can greatly ease strain and confusion. The scope of the testing evolution needs to be outlined so that key stakeholders have a global view of upcoming events. Daily e-mail reports to stakeholders and management can be used to effectively communicate key items of interest and preliminary data. Routine daily meetings (on site or remote) can also be established to reduce disruption of Test Facility evolutions, enabling staff to focus running the facility.

**PEP:** Key aspects of testing and key schedule events will be communicated prior to commencement of testing. WTP and PNNL communication offices will be actively involved during testing.

### **"Bus Stop" (Tour) Location**

**Discussion:** A test facility can generate much interest in project personnel, oversight groups, community leaders, as well as any project or site tour groups. A "bus stop" (i.e., tour stop) should be established and maintained. Planning should be done to identify where, what, and who will communicate information when a tour is required. While this sounds like a task of limited value it can serve great purpose as a communications tool. Diagrams, smaller displays, tour routes, data summaries should all be addressed. Keeping data summaries current is vital as a representation of the importance of the data. Routine tours enable briefing staff to answer questions. Easy-to-read information boards regarding the status of equipment and testing evolutions should be present so that tourists can be provided general information without entering the operating area. Input from Public Affairs personnel should be sought on what items of interest should be included.

**PEP:** A "tour stop" location with pictures, diagrams, up to date status and test info is planned. The PEP has set up a temporary viewing gallery to allow visitors to safely observe activities and equipment during installation.

### **Emergency Communications**

**Discussion:** In any operation or activity the unexpected may occur, requiring external communications, up to and including all forms of public communication (newspapers, TV, etc.), as well as local and national political figures. All organizations will typically have identified routes and points of communication; however, this could become an issue when multiple organizations are involved. For example, if one organization is responsible for the mechanical aspects, another for operations, and a third for oversight, establishing a system that provides for consistent communications and identifies the main communicator is important. Also the corporate internal communication chain may be different from the external communication chain. Backups for key links in these communication chains should be identified. Planning and even drills should be conducted to ensure the communication chain are operable.

The test facility operating team should have an established and tested emergency communication plan. Debugging these in a time of crisis is not a desired approach.

**PEP:** An emergency action and communications plan will be established utilizing both PNNL and WTP established procedures.

### III. Personnel

#### **Ensure Adequate and Appropriate Staffing of Activities**

**Discussion:** Installation, acceptance testing, shakedown, and testing activities need to be staffed with the right number and mix of resources to ensure test objectives are safely and efficiently met. The following should be considered when developing the staffing plan:

- Appropriate management presence during testing activities to facilitate communications (especially up the chain of command) and to address questions and issues.
- A means should be provided to involve production engineering staff assigned to design of the full-scale system design with participating in or observing evolutions at a Test Facility.

During acceptance testing and equipment shakedown, interlock and software errors may be uncovered. Ensure resources are identified, available, and scheduled to resolve these and other control issues that may be identified. Proper staffing for operations, testing, sample and data analysis, and reporting is vital to the success of testing activities.

**PEP:** Based on input from the Technical Exchange, the PEP team is re-evaluating the staffing needed to achieve PEP operational and testing objectives. A mix of PNNL and WTP Project personnel will be used to staff the PEP operation.

#### **Training: Train Staff to Process, Operating, Test, and Off-normal Procedures and Allow Sufficient Training Time**

**Discussion:** All shift engineers, testing staff, and shift management need to be trained prior to initiating shakedown and testing activities. Procedures addressing normal operations, off-normal response and recovery, and testing need to be included in the training program. Sufficient time should be scheduled to ensure training is completed, and should include both required reading and on-the-job training as necessary.

**PEP:** Training of shift and testing personnel have been part of the planning basis for the PEP. Additional consideration needs to be made regarding the scope and timing of training activities. Lessons learned as a result of personnel training and PEP startup and shakedown can likely be applied to cold startup of the Pretreatment Facility. A lessons learned summary of the PEP should be scheduled and performed.

#### **Establish a Formal Mechanism to Communicate to Test/Operating Shifts/Crews**

**Discussion:** Testing conditions, equipment configuration, maintenance activities, standing orders, and night orders need to be communicated to the shift manager, shift engineers, and samplers. A mechanism to facilitate communication from the JTG to shifts and between shifts needs to be formalized and used. Do not depend totally on written communications. Meetings, group sessions, etc should be held in support of written communications whenever possible to ensure adequate understanding.

**PEP:** Test Instructions containing specific direction to shift and testing personnel have been planned for the PEP since the initial test planning documents were drafted. Based on THOR's testing experience at the Hazen facility, PEP test planners are evaluating implementation of a single sheet that lists equipment parameters and ranges as an additional communication tool.

### **Document all Roles, Responsibilities, and Authorities of Teams and Personnel**

**Discussion:** Identification and documentation of roles, responsibilities, and authorities is a key element of a graded approach to conduct of operations for operating a Test Facility. Clear identification and documentation of roles, responsibilities, and authorities is important to the overall success of acceptance, shakedown, and testing activities.

**PEP:** A Project Execution Plan for the PEP is being developed that identifies and document roles, responsibilities, and authorities.

### **Have Knowledgeable Backups for Key Personnel**

**Discussion:** A number of roles in the organization -- especially C&I engineers -- are critical to the success of a testing program. Other key roles include the shift manager and testing director. Key roles and personnel should be backed up to ensure the testing schedule can be maintained in the event that the key personnel are injured or become unavailable.

**PEP:** Based on input from the Technical Exchange, the PEP staffing plan is being re-examined to ensure key staff are backed up.

## **IV. Simulant**

### **Simulant – Formulation, Handling, Manufacturing, Disposal - Many Factors to Consider**

**Discussion:** The selection, development and use of simulants was one of the most discussed topics at Technical Exchange. The choice of the simulant, the relationship to actual waste, and its performance before and during the test can critically influence test results.

The physical/chemical parameters of the simulant and the attributes the simulant is being designed to mimic need to be carefully defined and approved by stakeholders prior to initiating procurement of the simulant components. Consideration should be made for naming a single point of contact to address all simulant recipe, procurement, transportation, and batch testing activities. Additionally:

- Simulant procurement should be carefully managed to ensure the vendor is accurately formulating the simulant in accordance with the recipe
- Scale-up should be considered, as necessary, to ensure the simulant can be successfully engineered from bench-scale to full-scale production
- An understanding of how the vendor is preparing the simulant should be obtained, including recipe steps and the quality of the ingredients (commercial or reagent grade)

- Ensure through dialogue and site visits that the vendor understands and can implement the simulant recipe
- Understand how the simulant ages, and procure simulant “just-in-time” to support receipt analysis and subsequent use in the Test Facility
- Procure enough simulant to ensure sufficient quantities are present to support testing as well as an allowance for potential reformulation, spills, or additional test runs
- Ensure sufficient time is provided in the schedule to allow for pre-testing by the simulant vendor, receipt analysis by the testing vendor, and testing prior to operating the Test Facility
- An early batch of the simulant should be tested prior to ensure that it is satisfactory.

Simulant transportation and handling requires prior planning:

- Simulant components may require careful handling to preclude potential transportation and storage issues associated with settling, mixing, moisture, aging, or changes in temperature
- Determine if the simulant shipment requires use of an inert environment (i.e., nitrogen blanketing) during shipping
- If aging is an issue, the ability to mix the simulant locally must be provided
- The containers in which the simulant is shipped (totes, tank trucks) drives the equipment and tools required for receipt by the testing vendor
- Receipt of simulant shipments, including parking, secondary containment, and simulant conveyance (pumps, fork trucks, etc.) needs to be planned to ensure receipt activities are efficient and comply with environmental and personnel safety requirements
- A primary and backup simulant mixing strategy (mixing by the vendor, mixing at the testing location, both) should be identified and implemented as necessary to help ensure testing schedules are met

**PEP:** The importance of simulant attributes, procurement, storage, and use prompted a several follow up meetings among WTP and PNNL staff to further evaluate the input from the Technical Exchange participants. The above considerations are being incorporated by PEP planners to ensure simulant management is effective and timely. A WTP Simulant coordinator position was established. The charter for this position is shown in attachment #6. A checklist of simulant issues and considerations is shown in attachment #7. Attachment #8 is a summary of the simulant lessons learned from WTP test programs.

## V. Equipment

### Address Maintenance

**Discussion:** Maintenance activities should be planned, including: periodicity of maintenance activities, number and type of spares, parts procurement, and instrument calibration/recalibration. An appropriately scoped and designed maintenance program should be considered to ensure to maximize the availability of the equipment for testing. Maintenance staffing should also be considered to ensure trained craft are available to perform planned maintenance and repair actions.

**PEP:** Although the PEP is not prototypic for remote equipment removal, a maintenance plan should be established. The planning basis for the PEP is to staff maintenance activities with available craft from the PNNL craft pool. Consideration will be made regarding whether to obtain the services of dedicated craft to support PEP testing. Critical spare parts have been ordered.

**C&I, Including Programming Verification, Will take Longer than Expected. If Possible, Use Manual Rather than Automated Control**

**Discussion:** Due to the complexity, acceptance testing of the controls, instrumentation, and NQA-1 data acquisition systems will likely take longer than expected. Acceptance testing and shakedown of these systems -- along with verification of the control logic software programming -- should be planned and realistically scheduled with sufficient time for issue resolution prior to initiating functional and integrated testing. On test platforms, it may be useful to use a manual control scheme instead of automated control. A manual control scheme allows the test equipment to be brought on line more quickly. Further, consideration needs to be made regarding the frequency to take data and write to the DAS. Key process parameters should be taken at a higher frequency, while less-important parameters should be taken at a lower frequency. Carefully analyzing the data needs will ensure the Test Facility's C&I system is optimized.

**PEP:** For the PEP, an integrated program schedule is being developed using input from PNNL, WTP, and service vendors and subcontractors to plan installation, acceptance testing, shakedown, and Phase 1 testing. Based on the results of the Technical Exchange, special consideration is being made to incorporate the complexity of the PEP controls and instrumentation into the schedule. The ultrafiltration and leaching unit operations of the PEP are being performed in part to demonstrate the functionality of the prototypic Pretreatment Facility control scheme. Use of a manual control scheme was therefore not considered.

**Consider the Long Term Plan for the Facility – It Could have Uses Beyond the Testing Envisioned for Today**

**Discussion:** Test facilities can have uses beyond initial testing. Options include operator training, process engineer training, process troubleshooting, optimization, and alternative equipment testing. Further, design revisions can be tested to demonstrate the mitigation of risk. Contractor management and the Department of Energy should consider developing a long-term plan for test facilities. Also, long term consideration of the end use of the facility may influence the initial location. The materials processed in the test facility (simulants or actual material), the scale of the facility, and cost to operate are just a few of the factors that must be considered in the long term disposition.

**PEP:** Longer term uses have been reviewed for the PEP and were discussed with DOE-ORP on March 23, 2007. Currently the long term disposition outlines the PEP to be used for optimization and alternate equipment testing or to be donated to local universities. Funding is required to do optimization and equipment testing which may not be available through the WTP Project. The preferred disposition path will be determined in later.

## VI. Operations

### *Good Conduct of Testing/Operations is Essential*

**Discussion:** A graded, documented conduct of operations approach is essential to ensure safe and effective Test Facility operations and testing evolutions. This graded approach includes clearly identified roles, responsibilities, authorities, training, startup and operating procedures, test procedures and implementing instructions, and a document hierarchy. Within the graded approach, implement a rapid, disciplined process to change test procedures and equipment configuration. Further, use of shift mentors to train less-experienced staff should be considered, along with back-stopping key personnel. If a large number of samples to be taken and the complexity of the equipment, a dedicated sampling group should be used to collect samples for analysis. Consistent with having clear lines of authority, a single shift manager would be responsible for all shift activities, including operations and testing.

**PEP:** Experienced shift engineers will be selected to staff the PEP and mentor younger engineers. Planning is in progress to incorporate and document a graded conduct of operations approach for the PEP.

### *"Expect the Unexpected"*

**Discussion:** While the phrase "expect the unexpected" is often overused, it still has direct applicability to all facilities, especially test facilities. Off-normal events can occur during operating and testing evolutions. An event management process to address response to off-normal events should be developed and implemented. Graded plans and procedures addressing event response, reporting, recovery, and event communications should be developed and used if necessary. Preplanned responses to testing and facility upsets need to be addressed, as well as non-time-critical issues such as actions to take if Test Facility equipment and instrumentation are degraded after shipping. Additionally, a planned startup sequence should be used to minimize equipment and facility upsets.

**PEP:** A HazOp is being performed to postulate potential operational issues with the PEP and identify and implement strategies to mitigate these issues. Further, response procedures are being developed concurrent with the PEP operating procedures to ensure that responses to off-normal events are planned. Surveillance procedures are also being developed to ensure PEP equipment is operating as indicated by the control system. Addressing off-normal events will be considered for inclusion in the PEP Communications Plan.

### *Use Event Investigation/Corrective Action Tools*

**Discussion:** As a follow up to "expecting the unexpected", event investigation and corrective action tools can be used to identify the factors influencing an event and subsequent resolution of identified issues, and the identification and resolution of adverse conditions. These tools can also be used to as part of an issue resolution trending process. As for any large testing program, identify the event investigation and corrective action tools that may be useful for executing the project, and implement the elements of these programs that are appropriate for testing evolutions. Follow-up assessments and surveillances may also be performed to determine the effectiveness of the corrective action. Establish a lessons learned procedure for the operations of the Test Facility. Communications of these lessons learned is especially important due to the short duration of testing that the facility may engage in.

**PEP:** These tools will be used if needed. In a broader sense, they already have been implemented by conducting this technical exchange and soliciting input on recommended actions from other sites.

***“Failures” are Important Test Outcomes***

**Discussion:** Results from carefully-planned testing evolutions can be used to obtain understanding of system being tested, regardless of whether the results are deemed a “success” or a “failure”. Unexpected outcomes from testing should not be labeled as failures, but should be considered opportunities to understand the system, fully documented, analyzed and issues resolved prior to full-scale facility commissioning. Failure conditions should be analyzed to determine initiating factors and added to the body of knowledge gained from “successful” tests.

**PEP:** All data will be investigated. No data will be disregarded without sufficient explanation. Data from unexpected results will be thoroughly analyzed.